

An Optically Triggered Q-Switched Photonic Crystal Laser

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Significant design freedom enables photonic crystal (PC) cavities to be fabricated that support optical modes with specific, favorable characteristics. For example, PC cavities can be designed to possess modes that have electric field distributions with substantial overlap with the PC holes and cladding. Such structures are ideally suited for integrating fluidic nonlinear optical materials within intense optical fields generated by PC lasers. In creating our optically triggered Q-switched PC laser, we designed and fabricated a PC cavity optimized to support two orthogonally polarized lasing modes [1]. The cavity was infiltrated with nematic liquid crystal which could then be aligned optically using a layer of photoaddressable polymer. The birefringent liquid crystal determined the lasing mode's polarization and enabled tuning of the lasing modes. By rotating the liquid crystal, the relative cavity mode losses (Q) of each mode could be controlled and laser emission could be reversibly optically switched between the two cavity modes. Switching the laser emission between two cavity modes dramatically enhances the achievable tuning of the laser and may eventually yield PC laser tuning ranges that exceed 100 nm.

- [1] B. Maune, *et. al.*, "An optically triggered Q-switched PC laser", in preparation.